

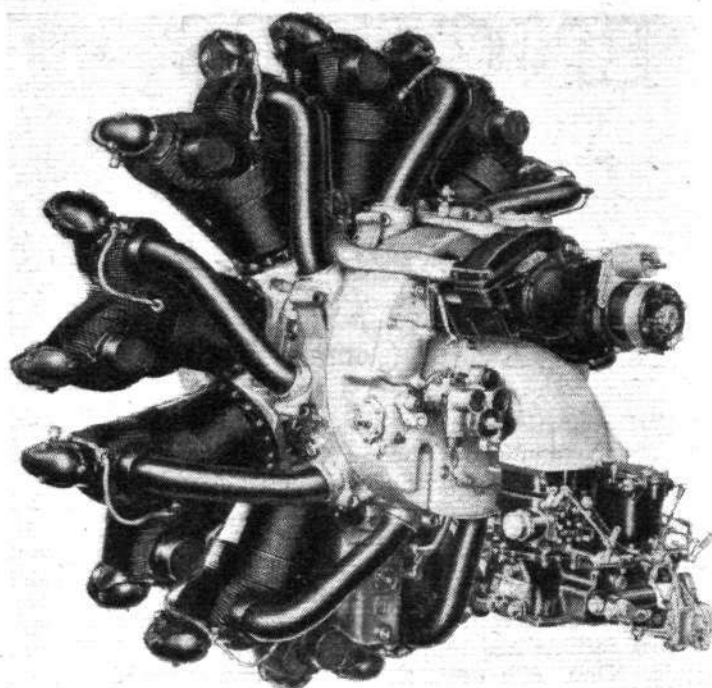
A new nine-cylinder radial, the Bramo 323 J Fafnir, powers the Dornier Do.19 experimental bomber. A Farman-B.M.W. reduction gear of 1.61:1 ratio is fitted and the engine is supercharged for operation at 13,780 feet.

has a Farman reduction gear and is rated at 5,250 ft., while the Sagitta II has an upturned spur-type reduction gear for cannon mounting and is fully supercharged with a normal rating of 500 h.p. at 12,150 ft.

At a time when the two-row radial is in the ascendancy it seems strange that a new design of large nine-cylinder, single-row engines should appear, particularly as Germany holds the licence to build Pratt and Whitney engines. The Bramo Fafnir's 850 h.p. should, however, have useful commercial applications.

A design not developed in this country is the inverted vee-eight air-cooled layout. Hirth and Argus models have been in wide use in Germany for some time in what might be called the higher-powered private owner and lower-powered commercial category, and examples of these appear at Milan.

The Czech name of Walter creeps into almost every category of aero engine, and there are very few firms which produce such a varied range in size and power rating. The tiny two-cylinder Atom is of only 1,100 c.c. capacity and gives a maximum of 28 h.p. at 3,000 r.p.m. The smallest inverted four in line is the Mikron, which is now in Mark II form, giving 62 h.p. for take-off. Another ultra-light unit is produced by C.N.A. at Rome.



Maker, Type, and Nationality	No. and Arrangement of Cyls.	Cooling	Capacity (litres)	Normal Power (h.p.)	Dry Weight (lb.)	Maker, Type, and Nationality	No. and Arrangement of Cyls.	Cooling	Capacity (litres)	Normal Power (h.p.)	Dry Weight (lb.)
ALFA ROMEO (Italy):						ISOTTA FRASCHINI (Italy):					
110 I.	4 I.L.	A.	6.124	120	288	Asso Caccia ...	12 V.	A.	20.61	440	840
115 I.	6 I.L.	A.	9.180	190	463	Asso 120 I.R.C.C.40 ...	—	—	26.085	665	1,146
D.2 C.30 ...	9 R.	A.	13.741	250	617	Asso XI R.2.40 ...	12 V.	Lq.	32.646	836	1,356
126 R.C.34 ...	9 R.	A.	28.63	750	1,069	Asso XI R.2.C.15 ...	12 V.	Lq.	32.646	880	1,356
126 R.C.10 ...	9 R.	A.	28.63	800	1,058	Asso L.121 R.C.40 ...	12 V.	Lq.	32.646	900	1,356
135 R.C.33 ...	18 2R.	A.	—	—	—	Asso XI R. ...	12 V.	Lq.	32.646	670	1,330
ARGUS (Germany):						Asso 750 R.C.35 ...	12 V.	Lq.	47.10	870	1,724
As. 10C. III ...	8 I.V.	A.	12.7	200	465	Astro 7 C.40 ...	7 R.	A.	20.8	400	723
BRANDENBURG (Germany):						Astro 7 C.21 ...	7 R.	A.	20.8	460	723
Bramo SH. 14 A.4 ...	9 R.	A.	7.7	128	297	Astro 140 R.C.35 ...	14 2R.	A.	34.688	820	1,290
Bramo Fafnir 323 J. ...	9 R.	A.	26.82	830	1,201	JUNKERS (Germany):					
C.N.A. (Italy):						Jumo 210 ...	12 I.V.	Lq.	19.7	550	974
C. II (bis) ...	2 H.O.	A.	1.4	38	20.6	Jumo 211 ...	12 I.V.	Lq.	35.0	700	1,278
C. VI R.C.43 ...	6 I.L.	A.	4.2	150	407	PIAGGIO (Italy):					
FIAT (Italy):						P. VII C.16 ...	7 R.	A.	19.334	460	716
A.70 ...	7 R.	A.	8.361	205	368	P. VII C.45 ...	7 R.	A.	19.334	450	750
A.30 R.A. ...	12 V.	Lq.	24.48	550	1,058	P. X R. ...	9 R.	A.	24.858	709	948
A.74 R.C.38 ...	14 2R.	A.	31.250	840	1,250	P. IX R.C.40 ...	9 R.	A.	24.858	600	981
A.80 R.C.41 ...	18 2R.	A.	45.720	1,000	1,598	P. XI R.C.40 ...	14 2R.	A.	38.6	1,000	1,444
A.80 R.C.20 ...	18 2R.	A.	45.720	1,100	1,598	P. XII R.C.40 ...	18 2R.	A.	56.904	1,600	1,764
A.S.6 (Racing) ...	24 V.	Lq.	51.100	3,100	2,050	GNOME-RHONE (France):					
HIRTH (Germany):						M.14 ...	14 2R.	A.	18.98	680	923
HM. 60R. ...	4 I.L.	A.	3.6	66	203	P.18 ...	18 2R.	A.	54.24	1,500	1,874
HM. 504A. ...	4 I.L.	A.	3.98	75	308.6	WALTER (Czechoslovakia):					
HM. 506A. ...	6 I.L.	A.	5.97	135	327	Atom ...	2 H.O.	A.	1.1	25	88
HM. 508H. ...	8 I.L.	A.	7.96	200	441	Mikron II ...	4 I.L.	A.	2.33	60	134
HISPANO-SUIZA (France):						Minor 4 ...	4 I.L.	A.	4.0	85	205
14 AA. ...	14 2R.	A.	45	980	1,311	Major 4 ...	4 I.L.	A.	6.124	120	308
14 AB. ...	14 2R.	A.	32	670	1,014	Major 6 ...	6 I.L.	A.	9.2	190	386
12 Yers. ...	12 V.	Lq.	36	880	1,030	Sagitta I.R.C. ...	12 I.V.	A.	18.37	470	794
						Sagitta II R.C. ...	12 I.V.	A.	18.37	435	860
						Bora II ...	9 R.	A.	9.35	210	364
						Bora II R. ...	9 R.	A.	9.35	230	379
						Super Castor I R.C. ...	9 R.	A.	18.8	400	782

R. = Radial. 2R. = 2 Row R. I. = Inverted. H.O. = Horizontally opposed. V. = "V" Formation. L. = In Line. Lq. = Liquid. A. = Air.

The Hafner's Tie-rods

"WE can see the limitations of fixed wings—we must beware of the limitations of fixed ideas; and if we are to avoid flying and thinking in circles we must make the wing rotate." This rather neat epigram concludes the lecture which Mr. R. Hafner is giving to the R.Ae.S. to-night. His subject is the Hafner Gyroplane, and he deals with it both historically and mathematically.

The Hafner A.R.III has already been described in *Flight*. The outstanding feature of the Hafner rotor head is the tie-rod which supports each rotor blade, affording it freedom to change its angle of incidence. This tie-rod also carries the centrifugal load of the blade, and it is no exaggeration to say that on the way in which the rod stands up to the loads imposed upon it depends the success of Mr. Hafner's scheme of incidence change. Fortunately, he is able to reassure his audience on this score. A tie-rod was given a very thorough test for possible fatigue effects, due to the torsional oscillation. A tensile load of 7.5 times the normal was applied, and a tor-

sional oscillation with an amplitude of more than three times the maximum possible in the aircraft. The frequency was about four times that which occurs in flight. The tie-rod underwent three million reversals (more than 60 hours) without showing signs of fatigue or strain. Thus it seems that one need have no fear on that score.

Reduced Profits

PRESUMABLY arising out of the Air Ministry's statement, at the inception of the present expansion scheme, that aircraft constructors' profits would be limited, reductions have been made in Hawker dividends. The Ordinary and "A" Ordinary dividends are reduced from 20 to 17½ per cent., apparently as a result of a drop in earnings disclosed by the accounts for the year ended March 31, trading profits being £140,494, against £196,101. After allowing for income-tax, appropriation to capital redemption reserve fund, and Preference dividend, practically the whole of the available profit remaining is absorbed by the dividend.